



# **Libyan International Medical University**

## **Faculty of Basic Medical Science**



### **Effect of video games on the brain**

Student: Taleb Elroey  
Student number: 1529  
Tutor: Asma elfarsi  
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## **Abstract**

The aim of this report is to highlight the effects of video games on brain functionally and how it can be used to train the brain of older-age people, this report shall discuss the changing of the behavior and the difference between the 2D and 3D games and the effect of the video games on the brain.

## **Introduction**

A video game is an electronic game that involves interaction with a user interface to generate visual feedback on a video device such as a TV screen or computer monitor. The word video in video game traditionally referred to a raster display device, but as of the 2000s, it implies any type of display device that can produce two- or three-dimensional images. Some theorists categorize video games as an art form, but this designation is controversial.

## **Discussion**

Interestingly, flow, according to psychologist Mihaly Csikszentmihalyi, is the secret to happiness and occurs when you are completely absorbed in an activity (often one that involves creativity). When one is immersed in flow, your sense of time becomes distorted because nearly all of your brain's available inputs are devoted to the activity at hand, Csikszentmihalyi states. While engaging in mindfulness and meditation may get you into a mental state of flow, so can hobbies you enjoy, like knitting and, perhaps, playing video games. Furthermore, a small amount of brain training can reverse age-related brain decline. Scientists at the University of California-San Francisco (UCSF) clarify that this provides a measure of scientific support in the brain fitness arena - criticized for lacking evidence - that brain training can stimulate meaningful and lasting changes. After 12 hours of training over the period of a month, study participants aged between 60 to 85 years improved performance on the game that surpassed that of individuals in their 20s playing the game for the first time. Moreover, two other significant cognitive areas were improved: working memory and sustained attention. These skills were maintained 6 months after completion of their training.

In addition," The finding is a powerful example of how plastic the older brain is," says Dr. Adam Gazzaley, Ph.D., UCSF associate professor of neurology, physiology and psychiatry and director of the Neuroscience Imaging Center. Dr. Gazzaley notes that it is encouraging that even a little brain training can reverse some of the brain decline that occurs with age. A recent study conducted by neurobiologists at the University of California-Irvine (UCI) found that playing 3-D video games could also boost the formation of memories. Participants were allocated to either a group that played video games with a 2-D environment or a 3-D environment. After playing the games for 30 minutes per day for 2 weeks, the students were given memory tests that engaged the brain's hippocampus. The participants in the 3-D group significantly improved their memory test scores compared with the 2-D group. The 3-D group's memory performance increased by 12 percent - the same amount that memory performance usually declines by between 45 and 70 years of age.<sup>(1)</sup> A meta-analysis of 116 studies recently published in *Frontiers in Human Neuroscience* set out to determine the "neural basis of video gaming," or what effects

gaming has on your brain. The authors noted. Moreover," It is not uncommon to hear both positive and negative health claims related to VGs [video games] in the mass media. Most of the time, these are unverified and sensationalist statements, based on 'expert' opinions, but lacking evidence behind them. On the other side, as VGs become more complex (due to improvements in computer hardware), they cater to audiences other than children, appealing to older audiences, and VGs have gained prevalence as a mainstream entertainment option. Consequently, the number of people who spend hours daily playing these kinds of games is increasing. There is interest in knowing the possible effects of long-term exposure to VGs, and whether these effects are generally positive (in the shape of cognitive, emotional, motivation and social benefits) ... or negative (exposure to graphic violence, contribution to obesity, addiction, cardio-metabolic deficiencies, etc.)." Because of the wide scope of the research, the researchers grouped the study into six main sections based on different cognitive functions and were able to reveal both positive and negative brain effects related to video games. Specifically:

It must be noted that the evidence suggests that video games may benefit attention, and video game players show improvements in selective attention, divided attention and sustained attention. "Improvements in bottom-up and top-down attention, optimization of attentional resources, integration between attentional and sensorimotor areas, and improvements in selective and peripheral visual attention have been featured in a large number of studies," the researchers noted. Another fundamental concept is visuospatial skills which refer to your ability to visually perceive the spatial relationship between objects. Some brain regions directly related to visuospatial and navigational skills are increased in video game players, and research suggests such skills may be enhanced in regular players.

Moreover, cognitive Workload This describes the mental resources required by a person engaged in a specific task or at a certain point in time. Video games play a role in cognitive workload, the researchers said, "Namely, the number of stimuli appearing simultaneously on the screen and the complexity of each stimulus seem to elicit different responses from the brain, Also, cognitive control includes abilities such as reactive and proactive inhibition, task switching and working memory, all of which may be required during any given video game session. This is yet another area that video games appear to benefit, with researchers noting, " ... Even short VG training paradigms showed improvements in cognitive control related functions, particularly working memory, linked to changes in prefrontal [brain] areas. Skill acquisition is another area where video game players seem to benefit, with overall skill acquisition improving after regular playing. According to the researchers, "It is likely that the exposure to a task first leads to an increase of activity in the associated regions, but ultimately, as the performance improves after repeated exposures, less cortical resources are needed for the same task. One of the studies included in the meta-analysis specifically noted that skills learned via playing video games may transfer to real life "Playing video games for as few as 10–20 h [sic] has been shown to improve performance on a number of attentional and perceptual tasks ... and on tasks requiring executive control. Such evidence has led to the development of video games that purportedly improve memory, attention, processing speed and performance in daily life. The assumption underlying these assertions is that skills acquired through training on one task (i.e., the video game) transfer to other untrained tasks, including complex real-world tasks.<sup>(2)</sup> While potentially leading to improvements in areas of attention, cognitive

control, visuospatial skills and more, the downside may be their effects on reward-processing areas of your brain. Many such areas have been shown to be affected in people with video game addiction, "an impulse-control disorder with psychological consequences, not unlike other addictive disorders, especially nonsubstance addictions such as pathological gambling," the study noted. "Internet gaming disorder" has been suggested as a new psychiatric diagnosis to be included in the American Psychiatric Association's "Diagnostic and Statistical Manual of Mental Disorders" latest edition, although others have suggested including such addiction under the broader category of "internet addiction. What's interesting is the researchers noted distinct differences in the brains of those addicted to video games as compared to professional and expert gamers, differences that persisted even after controlling for the amount of time spent playing video games. The neural patterns displayed by addicted video game players were indicative of an unbalanced reward system in the brain. The other potential downside is exposure to violent content, which is a prevalent theme in many adult video games. "It is likely that repeated exposure to violent content will trigger desensitization processes that affect regions linked to emotional and attentional processing," the researchers wrote. "It is hypothesized that this desensitization may result in diminished emotional responses toward violent situations, preventing empathy and lowering the threshold for nonadaptive behaviors linked to aggressiveness<sup>(3)</sup> Separate research attempted to tease out some of the variables that may influence problematic versus non-problematic video game playing in middle schoolers and revealed that the types of video games more often responsible for problematic use were role-play games and first-person shooter games, Negative consequences of video game playing were reported more often by girls than boys in this study and included eating problems, sleep and vision problems, conflicts with parents, loss of time, and lack of school investment.<sup>(4)</sup>

## Conclusion

To sum up, despite the popular belief that video games are detrimental for human well being, recent studies support the existence of their beneficial effects as well. Briefly, it also can be used as a trainer and prevent certain diseases and at the same time it could have problems such as risk of addiction.

## Reference

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